

# Challenge Based Learning in Embedded Engineering Education

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## **ABSTRACT**

Paper describes a work in progress project where active learning methods are studied in engineering education in a form of a multidisciplinary project. The active learning project and its implementation described in this paper are based on a study of project based learning in engineering education started in Information Technology department in academic year 2004. The project described in this paper is the 6th annual project and it takes place during the spring semester of the academic year 2009 – 2010.

A unique characteristic of the project described is that it integrates three separate courses including electronics, software design and verbal and written communications as one multidisciplinary project. Additional characteristic of the project is the challenging nature of the subject, since it is a product development project with a goal to design, build and implement a product according to given specifications and to test one's design against other project teams by participating to a series of competitions. Due the competitive nature of the project authors have named this teaching and activating learning method as Challenge Based Learning (CBL). The project mimics a real-life product development project requiring team working and project management skills, documentation and communication and problem solving skills in addition to strong engineering capabilities. Additionally the project itself is an example of strong and functioning cross-disciplinary co-operation among teachers which is an essential part of successful implementation of active learning methods and a requirement for effective development of engineering education

The Challenge Based Learning project is organized for 2nd year engineering students during the spring semester of the academic year. The topic of the project is to develop a remote-controlled robot and to participate to a series of competition taking place during the spring semester and having the main event by the end of the semester. Participation to the competition is a requirement for successful completion of the project and the evaluation of the project is partly based on the project team's success in the competition.

In this paper the development and the implementation of the project are described in detail. Additionally the learning outcomes and the assessment of the project are studied and feedback from the students and tutoring lecturers are analyzed. Based on the study and authors' long-term experiences from the CBL projects and active learning methods recommendations for future projects and their implementation are given. The goal of the paper is to provide useful information for anyone interested in arranging similar multidisciplinary Challenge Based Learning project.